The Analytical Approach to Information Value Management

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Abstract: Increased computer interconnectivity is offering organizations of all types unprecedented opportunities to improve operations, cutting costs, and sharing information. The success of many of these efforts depends, in part, of an organization ability to protect the data and systems, and mainly of the value of the used information.
The achievement is to identify the value of both the Information and the Information Infrastructure in order not to spend a penny more of the value of what it should be protected and to define the appropriate information business budget.
In general terms we can assume that the cyber dimension is a global set of information systems where it should be discerned two different accounts: the first is the snapshot of the patrimonial value of the information and the in use relative infrastructure. The second considers, in a given timeframe, the information income statement that means the cyber wealth produced.

1 INTRODUCTION

A "defined ICT architecture" can range in dimensions from a single INTERNET connected PC or a business INTRANET to the network realm of the civil service of a government or of the international governmental organizations:
Increased computer interconnectivity and the social acceptance of Internet are offering organizations of all types unprecedented opportunities to improve operations by reducing paper processing, cutting costs, and sharing information.

Furthermore the growing of interdependency of the complex integrated information systems will continue and accelerate and more technologies are integrated to deliver rich services. Today there is no way to model, understand, monitor and manage the risks presented by the growth of these systems.

Risk is defined as a feasible detrimental outcome of an activity or action subject to hazards. The risk is a word that admirably serves the forensic needs of new global culture and its calculation is deeply entrenched in science and manufacturing and as a theoretical base for decision making.

Generally speaking risks are generally classified as "speculative" (the difference between loss or gain, for example, the risk in gambling) and "pure risk", a loss or no loss situation, to which insurance generally applies.
The actual state of art has its milestone in the so called Probabilistic Risk Assessment -PRA-. The PRA has emerged as increasingly popular analysis tool especially during last decade. PRA is a systematic and comprehensive methodology to evaluate risks associated with every life- cycle aspect of a complex engineered technological entity from concept definition, through design, construction, and operation, and up to removal from service.

In PRA risk is characterized: the magnitude (or severity) of the adverse consequence(s) that can potentially result from the given activity or action, and the likelihood of occurrence of the given adverse consequence(s). If the measure of consequence severity is the number of people that can be potentially injured or killed, risk assessment becomes a powerful analytical too assess safety performances.

The risk is associated to a negative event and to the fact that for any negative event, normally, we have pure damages (the costs of the pure loss) resilience damages (the costs of reset) and consequential damages (can be the loss of image, business activity or a step of the threat to pursue other more harmful aims)

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However if we consider the speculative risk it should be considered also the "positive consequences" in accordance with the concept widely accepted in the business world of no risk no return. Individual investors managing their investments must be careful when it comes to the amount of risk that they take on. If they take on too much risk, perhaps by making aggressive investments, the losses could exceed their risk tolerance, or to be uncertain for comfort. On the other hand, if they failed to take on enough risk, by making conservative investments, they may earn returns that are stable, but inadequate for achieving the investor's financial objectives.
Risk management is not only about reducing downside potential or the probability of pain, but also about increasing upside opportunity or the prospects for gain.

In both cases the point of attack for any speculation and/or consideration is the value of the assets.

Value is a word whose meaning is different for different people. This is old as civilization. In the year 365 B.C. Aristotle had mentioned about seven type of values. They are: religious, political, social, aesthetic, ethical, economic, judicial. The economic value of goods, the only one that can be measured in terms of objective monetary units, presents two sides according to Aristotle. The one is the value that Aristotle called "natural" and it is exploited through the final consumption. The other "non natural" is realized by exchanging goods with each other, using it so you do not to meet the direct needs, but indirectly for other. In essence, Aristotle has a clear distinction between use value and exchange value, he shall notify heterogeneity and, just like the classic two thousand years later folds on money and on the market price as the best approximation to an ideal criterion of commutative justice.

Aristotle, in fact, acknowledges that the goods are the product of human labor, but as the jobs are different from each other qualitatively and quantitatively, the reference to the labor-time necessary to produce a commodity is not an adequate measure of exchange value, is the currency that we must therefore rely on. An information system is an engineered capital good that produces specific services in a defined organizational context, a delivery system.

In general terms we can assume that the information is moving, in a delivering system, from a point of production to a point of utilization, and a delivering system can be considered a multiple progressive segments of points of departure and points of arrivals for the information in accordance with the logical atomism.

-- Logical atomism is a philosophical belief that originated in the early 20th century with the development of analytic philosophy. The theory holds that the world consists of ultimate logical "facts" (or "atoms") that cannot be broken down any further.--

The information is produced (processed) in one physical site, stored in the same or in another site and communicate through a physical meaning to the site of utilization. All the three entities (production, communication and utilization) exploit instrumental items as facilities that are hosting pertinent devices, hardware, software, operation systems, applicative programs, files, physical meaning of communication (internal and external network) and are linked to the human factors as operational management policy, training, working activities and the end purpose of the delivered information.
This paper is organized in two main conceptual sections. The first one defines a set of models and pertinent indicators capable of creating qualitative standards of the value of information in an engineered capital good.

-- The model represents a set of equation and/or other mathematical relations with the capacity of apprehending the characteristics of the contingency situation and subsequently to describe, to estimate and to control the working out.--

The second aspects analyses the Aristotle's values that can affected the information management in the whole cyber dimension.
Particularly the economic value is accounted in a static and dynamic way: the first represents the snapshot of the information and the in use relative infrastructure balance sheet. The second considers, in a given timeframe, the information profit and loss statement that means the cyber services produced.

2 INFORMATION VALUE AND PERTINENT MODELS AND/OR PROFILES

2.1 A.I.M.S. (ABBO's Information Models for Security)

A system is a collection of interacting components, policies and procedures that are integrated and organized to react to an input and produce a predictable output and have a feedback. Everything is not a part of the system is called the surroundings

(Rogers, 2006). The components themselves and the relationships among them determine how the system works. A complex system is defined as a diverse system of sub- systems working together toward a common goal.

The three entity model or the ICT Security Company's System is the core model of A.I.M.S. (Abbo Information Models for Security) family (Abbo 2012 p 126). It is made of three sub – systems like three entities in a close market how it is illustrated in Figure 1 (Abbo, Sun, Feb 2009 pp 195 – 200).

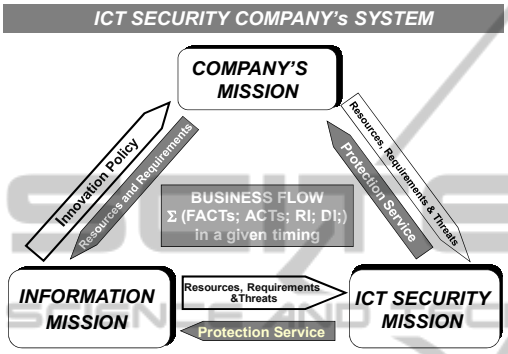

Figure 1: The three missions are the entities of a close market where Company and Information are the two customers of Security Services.

The three entity model is strictly linked to the definitions of real cost and functional cost of the resources. The real cost is the prize of a resource in the external market and is clearly represented in the balance sheet of the Company's mission. The functional cost is the percentage of each single resource that we should invest for the defensive measures of the resource for its operational survival.

The focal point is that considering each single resource in terms of 100 percent functional units we can share it in three complementary slots.

If we put on graphics the percent of each relevant resource that is dedicated respectively to the Information mission and to the ICT security mission we have the ISO-line of balanced budget (Figure 2).The value of security performance is represented by the ordinate of each point in the realistic curve that is a percentage value. The difference between one hundred and the value of security performance represents both the value of "threat performance" and the "quantitative risk analysis" for any model that has same premises and surrounding conditions.
By an analytical point of view that means to draw the curve **y = SP(x)**: the functional cost is fixed but the correspondence with the value of Security Performance Curve is variable that should be conquered on the field. While functional cost and security performance rates are variables that should be considered in the strategic planning, the dynamic confrontation is related to the operational planning.

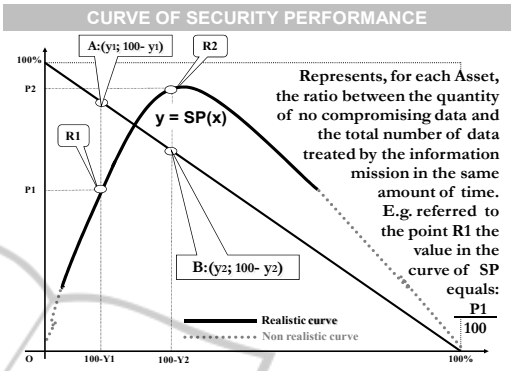

Figure 2: The curve is the representation of the ratio between security performance and functional cost of security mission.

The calculation of functional cost should be something of relatively easily to individuate and its acceptance as an analytical tool addresses any possible scenario represented by all the families of security performances in every IS security context. In addition any change in the security architecture of an existing or projected IS system should take always into consideration both the functional cost and the rate of security performance.

The combination of the functional costs is efficient only in the area represented by the integral of the realistic curve.

In the consideration of the inter-relation between Company Mission and Information Mission, in terms of percentage of dedicated resources, it is possible to create the Iso-line of balanced budget for e-government.

As for security management if we put on graphics the percent of each relevant resource that is dedicated respectively to the Company mission and to Information mission we have the ISO-line of balanced budget for e-government.

As for the graphic for security performance (previous Figure 2) the resources should be inclusive of all the assets, instrumental tools and human factors.
Now if we consider two ICT architecture the first with a minor rate of resources dedicated to Information Mission and the second with an increased rate of resources we have an increased performance of the second architecture. The advantage is measured in percentage of time reduction (gain of time) that the second architecture achieves compared with the first one. The curve that is called e-government

performance (Figure 3) is mathematically represented by the formula:

$$y = e\text{-}G(x) = \Delta I/\Delta T$$

Where ΔI represents the quantity of information that is delivering in a defined amount of time ΔT.

Anyway the curve is theoretical because we should take into consideration the underperformance of the second architecture and the security issues due to the threat successful attack to our information business flows. So the real curve is:

$$y = e\text{-}G(x) = (\Delta I/\Delta T - Tp\%/\Delta T)$$

where Tp%/ΔT stays for the Threat performance in a defined time ΔT.

A similar curve can be also build –up considering the competitive advantage that comes from the migration from a older technology and/or architecture to new ones.

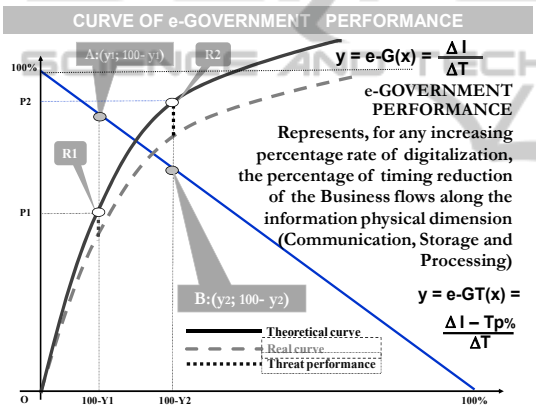

Figure 3: The curve is the representation of the ratio between the Information Performance and its running time.

The advantage of this analytical approach is that we have a scalar quantity that is a time that represents a measurable scale for compare two different architectures. That means that it is possible to make historical and future comparisons between increasing technologies.

The three entity model, on its applicative implementation to a given architecture, is able to determine the reduction of the value of information management due to losses The losses are dependent from threat performance in its widest sense that range from a human willingness to a human carelessness to an “act of GOD”. In order to determine the value of information management it is necessary an integration of other models that are considering the pure risks and the speculative risks. Generally speaking Risks are generally classified as “speculative” (the difference between loss or gain, for example, the risk in gambling) and “pure risk”, a loss or no loss situation, to which insurance generally applies (Broder p.630).

2.2 The Accounting Model

Value may be expressed in accordance with the accounting rules that means the release of the information balance sheet and the information income statement.

A balance sheet summarizes an organization or individual's assets, equity and liabilities at a specific point in time. We have two forms of balance sheet. They are the report form and the account form. Individuals and small businesses tend to have simple balance sheets. Larger businesses tend to have more complex balance sheets, and these are presented in the organization's annual report. Large businesses also may prepare balance sheets for segments of their businesses. A balance sheet is often presented alongside one for a different point in time (typically the previous year) for comparison.

An income statement (US English) or profit and loss account (UK English) is one of the financial statements of a company and shows the company's revenues and expenses during a particular period. It indicates how the revenues (money received from the sale of products and services before expenses are taken out, also known as the "top line") are transformed into the net income (the result after all revenues and expenses have been accounted for, also known as "net profit" or the "bottom line"). It displays the revenues recognized for a specific period, and the cost and expenses charged against these revenues, including write-offs (e.g., depreciation and amortization of various assets) and taxes. The purpose of the income statement is to show managers and investors whether the company made or lost money during the period being reported.

The application of the income statement to the cyber dimension represents a “snapshot” of the Information while the income statement represents the flow of Information or better the flow of “information traffic” in a defined period of time.

The build-up of both those documents for the cyber dimension can be representative both of the value of Information, in the broadest sense of the word, and of the losses due security breaches.

Balance sheet and income statement are referred to an unitary period of time normally one year or one semester. For the information value purposes

the unitary period of time should be the same of the business information flow (B.I.F.) life-cycle.

The quantity of information is normally encapsulated in business information flows (B.I.F.s) that we can defined as a summation of Acts, Facts, Requested Information and Delivered Information in a given timing:

$$\frac{\Sigma \{\text{Acts, Facts, RI, DI}\}}{\Delta T}$$

The facts consist on the potential productivity of the infrastructural architecture and the acts all the human and automatic actions connected with the architecture.

All those assets are component of the "chain of value" of the company to fulfill its mission and it's possible to measure them like an income account in a fiscal period.

The B.I.F. exist because has an unitary mission (Figure 4). If the mission of the B.I.F. cannot be fulfilled the B.I.F. should be not existing in the accounting scale and should be considered aborted or spoiled.

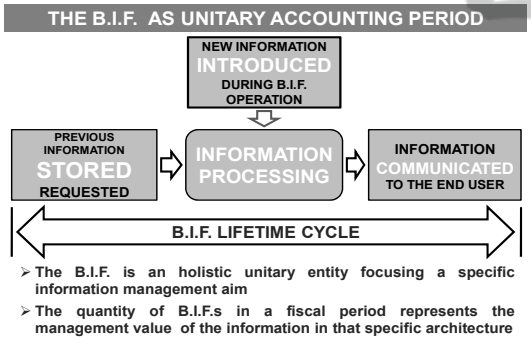

Figure 4: The unitary B.I.F. scheme.

In the global architecture accounting the quantity of B.I.F.s represents the management of information value. In other words the estimation of the value information of any single B.I.F. can account the global value of information management.

3 INFORMATION VALUE METRICS

The point of attack for any speculation and/or consideration for the rate of impact is the capacity of accounting the value of the assets that in the cyber world is represented by the information infrastructure, the information and the "information traffic".

The "information traffic" can be defined as the number of B.I.F.s that are carried out by an individuated operational information architecture in a given standardized period of time.
The value of "information traffic" can be related to value engineering (VE).
In today's economic environment, VE lays stress on economic values (Kumar, 2009 p. 38).

The constituents of economic value are: esteem value, exchange value, use value, cost value:

It requires some explanation in order to understand its relevance towards value engineering.

Exchange value is that value in the product, process, service or system which can help to trade with some other things. More the exchange value, more will it be lucrative for the customer.

Esteem value can be defined as that part of the product, process, service or system which will force the person to own them. In today's global economic situation, it becomes the responsibility for the manufacturer or service providers to inculcate these values. Esteem values are the want and the desire of the customers.

Use value of the product, process, service or system is that value for which the things has been created. Everything is being created to fulfil certain purpose. It should include the need of the customer.

Cost value is the cost of the product, process or service or the system. It is to be borne in mind that this cost is not only the acquisition cost but it is the total cost which in the parlance of finance is known as Life cycle cost (LCC) or cradle to grave cost.

As we have mentioned before value may be expressed in accordance with the accounting rules that should be adapted to means the release of the information balance sheet and the information income statement.
In an accounting perspective value may be expressed mathematically. The elements of the mathematical expression are performance (or function) and cost (Kumar, 2009 p. 39)

It can be stated as:

$$\text{Value} = \frac{\text{Performance (or function)}}{\text{Cost}}$$

In the information value management the unitary performance should be seen as the ratio between the speed of an unitary B.I.F. and its own cost.

The global performance is done, in a fiscal period, by the total number of B.I.F.s divided by the total cost where the total cost is the summation of the cost of B.I.F.s and the cost of the ones aborted or spoiled.
Such accounting solution is linked the information management value not only to the cost value but also to esteem, use and exchange values.

Aristotle and the contextualization of the information management in all the measurable issue of social sciences.

4 CONCLUSIONS

Value has different meaning for different people. The cyber dimension is producing a service and the subsequent issue is to estimate the value of that service. An information system is an engineered capital good that produces specific services in a defined organizational context, a delivery system with a chain of value.

The estimation of information management value should considers two different accounts: the first is the snapshot of the patrimonial value of the information and the in use relative infrastructure. The second considers, in a given timeframe, the information income statement that means the cyber wealth produced or more specifically the "information traffic".

A proper way to identify the value in the cyber dimension is to develop the capacity to map, monitor and manage the B.I.F.s with standardized procedures.

In such information value engineering frame it is possible to estimate all the values mentioned by Aristotle: religious, political, social, aesthetic, ethical, economic, judicial.

The impact of the implementation of such accounting solution and/or model represents the full integration of the seven type of values mentioned by Aristotle.

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